

Appendix 24.1

Terrestrial Ecology Technical Appendix

24 Terrestrial Ecology Technical Appendix

24.1 Introduction

24.1 This Technical Appendix presents the following information in support of Chapter 24 of the Dounreay Trì Floating Wind Demonstration Project Environmental Statement (ES):

- **Terrestrial ecology survey methods:** the methodology employed by Caledonian Conservation Ltd between 29 June and 03 July 2015 in order to provide baseline information on the habitat and protected species interests within the current onshore project area and surroundings. All deviations from guidance due to access restrictions are discussed and justified;
- **Existing records:** a summary of records of sensitive ecological features (i.e. sites, habitats and non-avian species that are afforded special protection, and/or are of conservation concern) received through data requests as part of the desk study; and
- **Additional botanical survey results:** extent of habitats/vegetation, quadrat and DAFOR (Dominant, Abundant, Frequent, Occasional, Rare) dominance scale data recorded during the National Vegetation Classification surveys and a list of plant species noted.

24.2 Terrestrial ecology survey methods

24.2 The following surveys were undertaken to determine the terrestrial ecological baseline within the search area:

- Desk-based study;
- Extended Phase 1 habitat survey ;
- National Vegetation Classification survey; and
- Scottish primrose (*Primula scotica*) survey.

24.3 Further details of the proposed surveys are provided in the following sections.

Extended Phase 1 habitat survey

24.4 A Phase 1 habitat survey was undertaken by Carolyn Gillen (Assistant Ecologist) between 01 and 03 July 2015. This is a standardised method of identifying and recording habitat and vegetation types, as set out in the Joint Nature Conservation Committee (JNCC) survey handbook (JNCC, 2010).

24.5 The entire survey area was visited and the vegetation mapped in the field onto 1:10,000 scale maps, using standard colour codes to represent each habitat type present. Notes were also taken in the field to describe each habitat type present.

24.6 In addition, descriptive 'target notes' of particular areas or features of interest were taken as required, with locations recorded using hand-held GPS devices and notes taken to describe the feature. Photographs were also taken at several locations to document habitat types present.

24.7 Although all habitats present were identified and mapped, particular attention was paid to identifying habitat areas of ecological importance, particularly those listed under Annex I of the Habitats Directive.

Protected species survey

24.8 The Phase 1 habitat survey was 'extended' by searching for signs of protected species within the terrestrial ecology search area and a 250 m buffer around this (with the exception of bats).

The survey targeted pine marten (*Martes martes*), otter (*Lutra lutra*), and badger (*Meles meles*). A summary of these methods is provided in Table 24A-1.

24.9 Structures (buildings and trees etc.) within 50 m of the terrestrial ecology search area were also assessed for their suitability to support bats (Chiroptera). All signs and sightings were recorded on large scale maps, and locations marked using hand-held GPS devices.

Table 24A-1: Information regarding protected mammal and reptile survey methods

Species	Relevant guidance/survey method followed	Field signs
Pine marten	Bang & Dahlstrøm (2006)	<ul style="list-style-type: none"> • Faeces – recognisable by their size, shape, and content, and also distinguishable from fox (<i>Vulpes vulpes</i>) droppings by their smell, if not desiccated¹; • Dens – usually in hollows in trees, but also subterranean dens amongst tree roots, should no suitable tree dens be present; and • Footprints – may be found on softer ground and can be differentiated from fox and other mustelids by size and shape.
Otter	Bang & Dahlstrøm (2006); and Chanin, (2003a; 2003b)	<ul style="list-style-type: none"> • Holts – below ground resting places; • Couches – above ground resting places; • Prints; • Spraints – faeces used as territorial markers, with a characteristic sweet odour; • Prey remains; and • Paths and slides
Badger	Roper (2010); Bang & Dahlstrøm (2006); and SNH (2002)	<ul style="list-style-type: none"> • Setts; • Prints; • Latrines/dung pits (used as territorial markers); • Hairs – highly distinctive, and often become snagged on fences; • Feeding signs – snuffle holes (small scrapes where badgers have searched for earthworms, insects or tubers); and • Paths.
Bats	Natural England (2009; 2014); and Hundt (2012)	<ul style="list-style-type: none"> • Buildings; • Old or veteran trees; • Bridges; and • Other man-made features such as mines • Hedgerows; • Woodland; • Rivers; and • Waterbodies (e.g. lochs).

¹ Although note that DNA tests may be required to confirm species identity.

Species	Relevant guidance/survey method followed	Field signs
Reptiles	The presence of any reptiles was noted and habitat was assessed as to its suitability to support reptiles (e.g. dense scrub, heathland, peatland, tussocky grassland etc. with a south-facing aspect).	

24.10 Full details for survey visits (including weather conditions) are included in Table 24A-2.

Table 24A-2: Extended Phase 1 habitat survey details

Date	Surveyor	Start Time	Hour	Visibility	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Frost	Snow
01/07/15	CG	08.30	1	2	1	ENE	0	7	2	0	0
			2	2	2	ENE	0	3	2	0	0
			3	2	2	ENE	0	3	2	0	0
			4	2	2	ENE	0	7	2	0	0
			5	2	2	ENE	0	4	2	0	0
			6	2	2	ENE	0	4	2	0	0
			7	2	3	ENE	0	8	2	0	0
			8	2	4	ENE	0	8	2	0	0
02/07/15	CG	09.00	1	2	1	WNW	0	6	2	0	0
			2	2	1	WNW	0	7	2	0	0
			3	2	1	WNW	0	8	2	0	0
			4	2	0	-	0	8	0	0	0
			5	2	1	WNW	0	8	1	0	0
			6	2	1	WNW	0	8	1	0	0
			7	2	0	-	0	8	0	0	0
			8	2	1	WNW	0	8	1	0	0
03/07/15	CG	09.00	1	2	3	WNW	0	2	2	0	0
			2	2	3	WNW	0	3	2	0	0
			3	2	4	WNW	0	2	2	0	0
			4	2	3	WNW	0	1	2	0	0

Date	Surveyor	Start Time	Hour	Visibility	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Frost	Snow
Key: <ul style="list-style-type: none"> • Visibility; 0 = <1 km; 1 = 1-2 km; 2 = ≥2 km • Wind direction: according to 16-point compass • Wind strength: according to the Beaufort scale • Cloud cover: in eighths of sky • Cloud height: 0 = <150 m; 1 = 150-500 m; 2 = >500 m • Rain: 0 = None; 1 = Drizzle/mist; 2 = Light showers; 3 = Light Rain; 4 = Heavy showers; 5 = Heavy rain • Frost: 0 = None; 1 = Ground; 2 = All day • Snow: 0 = None; 1 = Onsite; 2 = On high ground only • Surveyor: CG = Carolyn Gillen 											

National Vegetation Classification survey

- 24.11 A full National Vegetation Classification (NVC) survey of the terrestrial ecology search area was undertaken in order to identify any areas of habitat which may be included under Annex I of the Habitats Directive. The NVC survey was completed by Eamonn Flood (Senior Ecologist) between 29 June and 03 July 2015 following the methods described in Rodwell (2006).
- 24.12 Aerial photos were reviewed to give an overview of the search area and to identify broad distributions of vegetation types. An initial site walkover was then undertaken, noting the main NVC communities and mosaics present.
- 24.13 Where appropriate, 2 m x 2 m quadrats were used to collect data for comparison with species accounts published in Rodwell (1991a; 1991a; 1991b; 1992; 2000). Where the collection of quadrat data was found to be impractical, i.e. where the habitat was fragmented or occupied a very small area, the DAFOR dominance scale (Dominant, Abundant, Frequent, Occasional, Rare) was used to record habitats. These data can also be used for comparison with published species accounts.
- 24.14 The NVC communities identified were then mapped and community accounts provided, making particular reference to communities of conservation concern.
- 24.15 Communities were compared with the published descriptions. The survey was carried out.
- 24.16 Full details for survey visits (including weather conditions) are included in Table 24A-3.

Table 24A-3: NVC survey details

Date	Surveyor	Start Time	Hour	Visibility	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Frost	Snow
01/07/15	EF	08:30	1	2	1	ENE	0	7	2	0	0
			2	2	2	ENE	0	3	2	0	0
			3	2	2	ENE	0	3	2	0	0

Date	Surveyor	Start Time	Hour	Visibility	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Frost	Snow
			4	2	2	ENE	0	7	2	0	0
			5	2	2	ENE	0	4	2	0	0
			6	2	2	ENE	0	4	2	0	0
			7	2	3	ENE	0	8	2	0	0
			8	2	4	ENE	0	8	2	0	0
02/07/15	EF	09:00	1	2	1	WNW	0	6	2	0	0
			2	2	1	WNW	0	7	2	0	0
			3	2	1	WNW	0	8	2	0	0
			4	2	0	-	0	8	0	0	0
			5	2	1	WNW	0	8	1	0	0
			6	2	1	WNW	0	8	1	0	0
			7	2	0	-	0	8	0	0	0
			8	2	1	WNW	0	8	1	0	0
03/07/15	EF	09:00	1	2	3	WNW	0	2	2	0	0
			2	2	3	WNW	0	3	2	0	0
			3	2	4	WNW	0	2	2	0	0
			4	2	3	WNW	0	1	2	0	0
<p>Key:</p> <ul style="list-style-type: none"> • Visibility; 0 = <1 km; 1 = 1-2 km; 2 = ≥2 km • Wind direction: according to 16-point compass • Wind strength: according to the Beaufort scale • Cloud cover: in eighths of sky • Cloud height: 0 = <150 m; 1 = 150-500 m; 2 = >500 m • Rain: 0 = None; 1 = Drizzle/mist; 2 = Light showers; 3 = Light Rain; 4 = Heavy showers; 5 = Heavy rain • Frost: 0 = None; 1 = Ground; 2 = All day • Snow: 0 = None; 1 = Onsite; 2 = On high ground only • Surveyor: EF = Eamonn Flood 											

Identification of groundwater-dependent terrestrial ecosystems

24.17 Groundwater-dependent terrestrial ecosystems (GWDTes) are types of wetland specifically protected under the Water Framework Directive (WFD). Results from the NVC survey were used for identifying GWDTes using the relevant guidance (SEPA, 2012; UKTAG 2003; 2009). The process of identifying wetlands was also informed by the methodology published in SNIFFER (2009).

Scottish primrose survey

- 24.18 A survey for Scottish primrose was undertaken in conjunction with the NVC survey. This involved the surveyor walking the search area mapping locations of populations of Scottish primrose plants using hand-held GPS. Where necessary this involved close examination and handling of plants. Magnification was also be used to aid with identification if necessary.
- 24.19 All locations where Scottish primrose plants were recorded in 2007 (Morris, 2009) were revisited, and other potential habitat (coastal grassland and heathland, including areas between 5 m and 10 m of sea cliffs) was also surveyed within the search area in order to detect any new or unrecorded populations. A count of flowering and non-flowering Scottish primrose plants was made at each location.

Survey limitations

- 24.20 It was not possible to access Dounreay Nuclear Power Development Establishment and HMS Vulcan, although these areas were surveyed at a distance using magnification. However, given the small scale and temporary duration of the onshore works, this is unlikely to represent a significant data gap.

24.3 Existing records

- 24.21 Information relating to sensitive sites, habitats and species (i.e. those afforded special protection and/or of conservation concern), was supplied by the following organisations:
- Scottish Natural Heritage (SNH);
 - Scottish Badgers (SB);
 - Highland Biological Recording Group (HBRG); and
 - Amphibian and Reptile Conservation Trust (ARC).
- 24.22 Summaries of relevant records are presented below.

Designated sites

- 24.23 SNH provided information relating to designated sites, but did not provide any records of sensitive habitats or species.
- 24.24 Sandside Bay SSSI, which is designated for its sand dune habitats, lies partly within the current onshore project area. The sand dune habitats within the SSSI are also listed under Annex I of the Habitats Directive. A previous NVC survey of the site found a complex mosaic of sand dune, mesotrophic grassland and other habitats, where a narrow edge of mobile dunes (SD6) quickly becomes semi-fixed dunes (SD7) which dominate the foredune zone (Dargie, 1998). A small area of dune wetland was also found to be present in the centre of the SSSI (Dargie, 1998). The SSSI is largely fringed by mesotrophic grassland (MG6) to the east and west (Dargie, 1998).
- 24.25 Further details of all designated sites are presented in Chapter 24: Terrestrial Ecology.

Botanical species

- 24.26 Scottish primrose (*Primula scotica*) has been recorded within the terrestrial ecology search area, at Sandside Head and Reay Golf Course (Morris, 2009). The population at Sandside Head was found to be large, with an estimated population of 5,000 to 10,000 plants in 2007 (Morris, 2009). However, the population was estimated at more than 400,000 plants in 1995, indicating a decline between then and 2007 (Morris, 2009). The population at Reay Golf Course was estimated at three plants in 2007, when it was first formally surveyed, and represents a small population (Morris, 2009). Scottish primrose are present at a number of locations throughout

the North Caithness coast, and it is possible other populations may be found elsewhere in the search area.

Fungi

- 24.27 The yellow foot waxcap (*Hygrocybe flavipes*) has been recorded just outside the search area at Sandside Head in 2014 (based on HBRG data), and is included on the Caithness LBAP.

Mammals

- 24.28 SB did not hold any records of badgers within 2 km of the terrestrial ecology search area, although the area is considered to be under-recorded.
- 24.29 There were no records of otter although they are a designated feature of the Caithness and Sutherland Peatlands Special Area of Conservation (SAC) located approximately 1.7 km to the south-west of the terrestrial ecology search area, and are also known to be present along the coast in the wider area (based on historic Caledonian Conservation data).
- 24.30 Two historic records of pine marten within 2 km of the terrestrial ecology search area have been received to date (based on HBRG data). One of these records relates to a confirmed breeding den.
- 24.31 Both brown long-eared bat (*Plecotus auritus*) and common pipistrelle (*Pipistrellus pipistrellus*) have been recorded within 2 km (based on HBRG data). One of these records relates to a confirmed common pipistrelle roost.

Reptiles

- 24.32 Although no historic records of reptiles relevant to the search area were identified, both adders (*Vipera berus*) and slow-worms (*Anguis fragilis*) are known to be present in the wider area (based on HBRG and ARC data).

Invertebrates

- 24.33 The great yellow bumblebee (*Bombus distinguendus*), which is included on the Scottish Biodiversity List as a priority species, has been recorded within the terrestrial ecology search area (two records from 2009 based on HBRG data).
- 24.34 Other bumblebee species, all included as priority species on the Caithness Local Biodiversity Action Plan (LBAP), have also been recorded within the terrestrial ecology search area and wider area (based on HBRG data), including small garden bumblebee (*Bombus hortorum*), broken-belted bee (*Bombus soroensis*), common carder bee (*Bombus pascuorum*), northern white-tailed bumblebee (*Bombus magnus*) and early bumblebee (*Bombus pratorum*).
- 24.35 In addition, several butterfly species included on the Caithness LBAP have been recorded within the search area and wider area (based on HBRG data), including red admiral (*Vanessa atalanta*), common blue (*Polyommatus Icarus*), meadow brown (*Maniola jurtina*) and small tortoiseshell (*Aglais urticae*).

24.4 Additional botanical survey results

- 24.36 Key results from the terrestrial ecology surveys are presented in Chapter 24: Terrestrial Ecology. However, additional results from the botanical surveys not presented within the technical chapter are included below. Note that botanical nomenclature in this technical appendix follows Stace (2010).

Extent of habitats recorded during the botanical surveys

24.37 The total and percentage areas of each Phase 1 habitat type and NVC communities recorded within the terrestrial ecology search area are presented in Table 24A-4 (Phase 1 habitats) and 24A-5 (NVC communities).

Table 24A-4: Total and percentage areas of Phase 1 habitat types recorded within the terrestrial ecology search area

Phase 1 code	Phase 1 habitat	Area within terrestrial ecology search area (ha)	Extent of terrestrial ecology search area (%)
J1.1	Arable	39.86	42.29
B2.2	Semi-improved neutral grassland	21.53	22.85
B4	Improved grassland	15.71	16.67
H8.4	Coastal grassland	9.79	10.39
B5	Marshy grassland	4.64	4.93
H6.8	Open dune	1.75	1.86
H8.1	Maritime hard cliff	0.56	0.59
J4	Bare ground	0.40	0.42
Total		94.25	100.0

Table 24A-5: Total and percentage areas of NVC communities within the NVC survey area and terrestrial ecology search area

NVC code	NVC community	Area within NVC survey area (ha)	Extent of NVC survey area (%)	Extent of terrestrial ecology survey area (%)
MG1	<i>Arrhenatherum elatius</i> grassland	<0.01	<0.01	<0.01
SD6	<i>Ammophila arenaria</i> mobile dune	0.13	0.14	0.14
SD8/ SD7/ MG1	<i>Festuca rubra</i> – <i>Galium verum</i> fixed dune grassland/ <i>Ammophila arenaria</i> – <i>Festuca rubra</i> semi-fixed dune/ <i>Arrhenatherum elatius</i> grassland	0.62	0.66	0.66
SD8	<i>Festuca rubra</i> – <i>Galium verum</i> fixed dune grassland mosaic	0.08	0.08	0.08
SD8/ MG1	<i>Festuca rubra</i> – <i>Galium verum</i> fixed dune grassland/ <i>Arrhenatherum elatius</i> grassland mosaic	0.75	0.79	0.79

NVC code	NVC community	Area within NVC survey area (ha)	Extent of NVC survey area (%)	Extent of terrestrial ecology survey area (%)
SD7/ SD8	<i>Ammophila arenaria</i> – <i>Festuca rubra</i> semi-fixed dune/ <i>Festuca rubra</i> – <i>Galium verum</i> fixed dune grassland mosaic	0.47	0.50	0.50
MG7	<i>Lolium perenne</i> improved grassland	15.81	16.85	16.77
OV1-19	Arable land	39.92	42.55	42.36
MG6	<i>Lolium perenne</i> – <i>Cynosurus cristatus</i> grassland	12.85	13.69	13.63
MG6/ MG10	<i>Lolium perenne</i> – <i>Cynosurus cristatus</i> grassland/ <i>Holcus lanatus</i> – <i>Juncus effusus</i> rush pasture mosaic	4.62	4.93	4.90
MG6/M C10	<i>Lolium perenne</i> – <i>Cynosurus cristatus</i> grassland/ <i>Festuca rubra</i> – <i>Plantago</i> spp. maritime grassland mosaic	4.37	4.65	4.63
MC10/ H7/MG 6	<i>Festuca rubra</i> – <i>Plantago</i> spp. maritime grassland/ <i>Calluna vulgaris</i> – <i>Scilla verna</i> heath/ <i>Lolium perenne</i> – <i>Cynosurus cristatus</i> grassland mosaic	9.22	9.82	9.78
MG1/ MG6/ OV25	<i>Arrhenatherum elatius</i> grassland/ <i>Lolium perenne</i> – <i>Cynosurus cristatus</i> grassland/ <i>Urtica dioica</i> – <i>Cirsium arvense</i> mosaic	4.46	4.75	4.73
Rock/ MC8/ MC10	Rock/ <i>Festuca rubra</i> – <i>Armeria maritima</i> grassland/ <i>Holcus lanatus</i> – <i>Juncus effusus</i> rush pasture mosaic	0.54	0.57	0.57
Total		93.82	100.0	99.55

NVC quadrat and DAFOR data

24.38 DAFOR and quadrat data recorded during the NVC data are presented in Tables 24A-6 to 24A-13.

NVC quadrat and DAFOR data

Table 24A-6: SD2 DAFOR data

Species	Abundance
<i>Honckenya peploides</i>	O
<i>Cakile maritima</i>	O
Key: D = Dominant; A = Abundant; F = frequent; O = Occasional; R = Rare	

Table 24A-7: SD4 DAFOR data

Species	Abundance
<i>Elytrigia juncea</i>	D
<i>Ammophila arenaria</i>	O
<i>Elymus pycanthus</i>	O
<i>Cakile maritima</i>	O
<i>Atriplex liciniata</i>	O
<i>Tussilago farfara</i>	O
Key: D = Dominant; A = Abundant; F = frequent; O = Occasional; R = Rare	

Table 24A-8: SD7 Quadrat data

Species	Quadrat and grid reference									
	SD6.1	SD6.2	SD6.3	SD6.4	SD6.5	SD6.6	SD6.7	SD6.8	SD6.9	SD6.10
	NC 96501 65240	NC 96335 65264	NC 96258 65263	NC 96774 65434	NC 96716 65380	NC 96891 65530	NC 96800 65463	NC 96872 65579	NC 96772 65884	NC 95766 65495
<i>Achillea millefolium</i>										
<i>Ammophila arenaria</i>	7	8	9	9	6	3	8	8	8	5
<i>Atriplex laciniata</i> Orache						3			3	2
<i>Cakile maritima</i>	1				3			1		
<i>Carex arenaria</i>						3		3		6
<i>Centaurea nigra</i>					3					
<i>Cirsium arvense</i>	3	3	1				3	1	3	1
<i>Dactylis glomerata</i>			1							
<i>Elytrigia juncea</i>	3									4
<i>Euphrasia</i> agg.										
<i>Festuca rubra</i>	3								4	
<i>Holcus lanatus</i>	3		3							
<i>Honckenya peploides</i>						3		1		
<i>Hypnum cupressiforme</i>						3				
<i>Hypochaeris radicata</i>	3	1	2	2	3					
<i>Lathyrus pratensis</i>							3			
<i>Leucanthemum vulgare</i>				1						
<i>Lotus corniculatus</i>					2					
<i>Luzula campestris</i>										
<i>Tripleurospermum inodorum</i>								2		
<i>Myosotis arvensis</i>										
<i>Plantago lanceolata</i>						1				

	Quadrat and grid reference									
	SD6.1	SD6.2	SD6.3	SD6.4	SD6.5	SD6.6	SD6.7	SD6.8	SD6.9	SD6.10
Species	NC 96501 65240	NC 96335 65264	NC 96258 65263	NC 96774 65434	NC 96716 65380	NC 96891 65530	NC 96800 65463	NC 96872 65579	NC 96772 65884	NC 95766 65495
<i>Poa pratensis</i>						3		3	2	
<i>Ranunculus repens</i>							3			
<i>Rumex acetosa</i>						2				
<i>Scilla verna</i>										
<i>Senecio jacobaea</i>	3				3	1	2			
<i>Succisa pratensis</i>										
<i>Taraxacum</i> agg.						2	2	3	3	
<i>Tussilago farfara</i>	5	4	3				4			
<i>Valeriana officinalis</i>	1		2		3					
<i>Vicia cracca</i>	3				3	2				
Bare sand	8	9	8	9	9	9	5	8	3	8

Table 24A-10: SD8 Quadrat data

Species	Quadrat and grid reference									
	SD8.1	SD8.2	SD8.3	SD8.4	SD8.5	SD8.6	SD8.7	SD8.8	SD8.9	SD8.10
	NC 96060 65196	NC 96251 65094	NC 96251 65019	NC 96397 65110	NC 96540 64984	NC 96637 65036	NC 96677 65062	NC 96702 65075	NC 96959 65241	NC 97226 65204
<i>Achillea millefolium</i>				3	3		4		3	3
<i>Anthoxanthum odoratum</i>						7			3	
<i>Arrhenatherum eliatum</i>	3	3	3			5		4		
<i>Atriplex laciniata</i>										
<i>Bellis perennis</i>							3		3	3
<i>Cakile maritima</i>										
<i>Cerastium fontanum</i>						3	5	3	3	
<i>Carex arenaria</i>						6				
<i>Centaurea nigra</i>		4	3		2			3		
<i>Cirsium arvense</i>					2					
<i>Dactylis glomerata</i>		4	1			5		3		
<i>Dactylorhiza purpurella</i>					2				1	
<i>Euphrasia</i> agg.	2		2	2				2	2	3
<i>Festuca rubra</i>	8	7	9	8	7	7	9	9	7	9
<i>Filipendula ulmaria</i>									3	
<i>Galium verum</i>	5	3	3	6	3	4	6		6	7
<i>Heracleum sphondylium</i>								2		
<i>Holcus lanatus</i>	4		2	3	3		7			6
<i>Honckenya peploides</i>										
<i>Hypnum cupressiforme</i>		6			8	4			7	
<i>Hypochaeris radicata</i>					3					
<i>Lathyrus pratensis</i>	3		3							

Species	Quadrat and grid reference									
	SD8.1	SD8.2	SD8.3	SD8.4	SD8.5	SD8.6	SD8.7	SD8.8	SD8.9	SD8.10
	NC 96060 65196	NC 96251 65094	NC 96251 65019	NC 96397 65110	NC 96540 64984	NC 96637 65036	NC 96677 65062	NC 96702 65075	NC 96959 65241	NC 97226 65204
<i>Linum catharticum</i>				2	2					
<i>Listera ovata</i>										
<i>Lotus corniculatus</i>	4	3	4	5	4				6	
<i>Luzula campestris</i>						3			3	
<i>Luzula sylvatica</i>	3									
<i>Plantago lanceolata</i>	3	3	3	4	1				3	
<i>Poa pratensis</i>	4	4	3	5			3	6	3	5
<i>Primula vulgaris</i>		3	4	4	4				3	
<i>Pseudoscleropodium purum</i>			4			4				
<i>Ranunculus acris</i>	3	1	4	4	3	3			3	3
<i>Ranunculus repens</i>					2					
<i>Rhynanthus minor</i>									3	
<i>Rhytidadelphus squarrosus</i>	6	6	4	8		7				7
<i>Scilla verna</i>									2	
<i>Succisa pratensis</i>										
<i>Taraxacum</i> agg.										
<i>Thymus polytrichus</i>					2				7	
<i>Trifolium repens</i>	3			3		3	3			7
<i>Veronica chamaedrys</i>	4	3		3	3	3	6	4	3	3
<i>Viola riviniana</i>	3	3	3	4	2					
<i>Vicia cracca</i>	5			3		2				
Bare ground					3					

Table 24A-11: M10 DAFOR data

Species	Abundance
<i>Carex panicea</i>	D
<i>Carex nigra</i>	F
<i>Briza media</i>	F
<i>Euphrasia</i> agg.	F
<i>Carex flacca</i>	O
<i>Carex lepidocarpa</i>	O
<i>Linum catharticum</i>	R
Key: D = Dominant; A = Abundant; F = frequent; O = Occasional; R = Rare	

Table 24A-12: M15 DAFOR data

Species	Abundance
<i>Calluna vulgaris</i>	D
<i>Eriophorum angustifolium</i>	F
<i>Sphagnum capillifolium</i>	F
<i>Carex panicea</i>	F
<i>Carex nigra</i>	O
<i>Agrostis</i> spp.	O
<i>Nardus stricta</i>	O
Key: D = Dominant; A = Abundant; F = frequent; O = Occasional; R = Rare	

Table 24A-13: H7 quadrat data

Species	Quadrat and grid reference			
	H7.1	H7.2	H7.3	H7.4
	NC 96756 66050	NC 97302 66467	NC 97188 66500	NC 96704 66247
<i>Achillea millefolium</i>				
<i>Agrostis capillaris</i>	3		3	3
<i>Anthoxanthum odoratum</i>	4	4		4
<i>Anthyllis vulneraria</i>	4			2
<i>Armeria maritima</i>				3
<i>Bellis perennis</i>	4			3
<i>Calluna vulgaris</i>	7	8	7	6
<i>Carex flacca</i>	3	4		
<i>Carex panicea</i>		3	4	3
<i>Carex pulicharis</i>				3
<i>Empterum nigrum</i>			4	8
<i>Euphrasia</i> agg.				
<i>Festuca ovina</i>		3	3	
<i>Festuca rubra</i>	7	6	6	
<i>Holcus lanatus</i>	3	2	2	
<i>Hylochomium splendens</i>		5		
<i>Hypnum cupressiforme</i>		4		
<i>Hypochaeris radicata</i>	1			
<i>Lotus corniculatus</i>		4	2	4
<i>Luzula campestris</i>	3			3
<i>Nardus stricta</i>		4		
<i>Pedicularis sylvatica</i>		4	3	
<i>Plantago coronopus</i>	1			
<i>Plantago lanceolata</i>	3	3	3	3
<i>Plantago maritima</i>	3			3
<i>Poa pratensis</i>	4			
<i>Potentilla erecta</i>	3	3	3	4
<i>Rhynanthus minor</i>		3		
<i>Scilla verna</i>	3			3
<i>Thymus polytrichus</i>	3			3
<i>Trifolium repens</i>	4			3

Plant species list

24.39 A list of plant species recorded during the NVC survey is provided in Table 24A-14. Note that this is not intended as an exhaustive list of plant species present within the terrestrial ecology search area.

Table 24A-14: List of plant species recorded during the NVC survey

<i>Achillea millefolium</i>	<i>Galium vernum</i>
<i>Agrostis capillaris</i>	<i>Geum rivale</i>
<i>Ammophila arenaria</i>	<i>Heracleum sphondylium</i>
<i>Anthoxanthum odoratum</i>	<i>Holcus lanatus</i>
<i>Anthyllis vulneraria</i>	<i>Honckenya peploides</i>
<i>Armeria maritima</i>	<i>Hylochomium splendens</i>
<i>Arrhenatherum eliatum</i>	<i>Hypnum cupressiforme</i>
<i>Atriplex laciniata</i>	<i>Hypochaeris radicata</i>
<i>Bellis perennis</i>	<i>Iris pseudacorus</i>
<i>Briza media</i>	<i>Juncus effusus</i>
<i>Cakile maritima</i>	<i>Lathyrus pratensis</i>
<i>Calluna vulgaris</i>	<i>Leucanthemum vulgare</i>
<i>Carex arenaria</i>	<i>Linum catharticum</i>
<i>Carex flacca</i>	<i>Listera ovata</i>
<i>Carex panicea</i>	<i>Lolium perenne</i>
<i>Carex pulicharis</i>	<i>Lotus corniculatus</i>
<i>Centaurea nigra</i>	<i>Luzula campestris</i>
<i>Cerastium fontanum</i>	<i>Luzula sylvatica</i>
<i>Chamerion angustifolium</i>	<i>Mimula guttatus</i>
<i>Cirsium arvense</i>	<i>Myosotis arvensis</i>
<i>Cirsium vulgare</i>	<i>Myosotis secunda</i>
<i>Cynosurus cristatus</i>	<i>Nardus stricta</i>
<i>Dactylis glomerata</i>	<i>Ononis repens</i>
<i>Dactylorhiza purpurella</i>	<i>Pedicularis sylvatica</i>
<i>Elytrigia juncea</i>	<i>Phleum pratense</i>
<i>Empterus nigrum</i>	<i>Plantago coronopus</i>
<i>Epilobium palustre</i>	<i>Plantago lanceolata</i>
<i>Euphrasia agg.</i>	<i>Plantago maritima</i>
<i>Festuca ovina</i>	<i>Pleurozium schreberi</i>
<i>Festuca rubra</i>	<i>Poa pratensis</i>
<i>Filipendula ulmaria</i>	<i>Polygala serpyllifolia</i>
<i>Potentilla erecta</i>	<i>Potentilla anserina</i>
<i>Primula scotica</i>	<i>Stellaria palladia</i>

<i>Primula vulgaris</i>	<i>Succisa pratensis</i>
<i>Pseudoscleropodium purum</i>	<i>Taraxacum</i> agg.
<i>Ranunculus acris</i>	<i>Thymus polytrichus</i>
<i>Ranunculus repens</i>	<i>Trifolium repens</i>
<i>Rhynanthus minor</i>	<i>Tripleurospermum inodorum</i>
<i>Rhytidiadelphus squarrosus</i>	<i>Tussilago farfara</i>
<i>Rhytidiadelphus triquetrus</i>	<i>Urtica dioica</i>
<i>Rumex acetosa</i> <i>Rumex crispus</i>	<i>Valeriana officinalis</i>
<i>Rumex obtusifolium</i>	<i>Veronica chamaedrys</i>
<i>Scilla verna</i>	<i>Vicia sepium</i>
<i>Senecio jacobaea</i>	<i>Vicia cracca</i>
<i>Silene uniflora</i>	<i>Viola riviniana</i>
<i>Stellaria holostea</i>	
<i>Stellaria media</i>	

24.5 References

- Averis, B. 2013. *Plants and Habitats*. Ben Averis, East Lothian.
- Bang, P. and Dahlstrøm, P. 2006. *Animal Tracks and Signs*. Oxford University Press, Oxford.
- Cathrine, C. 2015. *Hexicon AB Caithness Cable Route: Ecology Desk Study CC0294/R1*. Caledonian Conservation Ltd, Bridge of Allan.
- Chanin, P. 2003a. *Monitoring the Otter Lutra lutra. Conserving Natura 2000 Rivers Monitoring Series No. 10*. English Nature, Peterborough.
- Chanin, P. 2003b. *Ecology of the European Otter. Conserving Natura 2000 Rivers Ecology Series No. 10*. English Nature, Peterborough.
- Dargie, T. 1998. *Sand dune vegetation survey of Scotland: North West*. Scottish Natural Heritage Research, Survey and Monitoring Report No. 126. Vols. 1-3. SNH.
- Hundt, L. 2012. *Bat Surveys – Good Practice Guidelines, 2nd Edition*. Bat Conservation Trust, London.
- Joint Nature Conservancy Council (JNCC) 2010. *Handbook for Phase 1 habitat survey: a technique for environmental audit*. JNCC, Peterborough.
- JNCC. 2015. *Annex I habitats and Annex II species occurring in the UK*. Available at <http://jncc.defra.gov.uk/page-1523> (accessed 15 July 2015).
- Morris, J. 2009. *Primula scotica survey in Caithness and Sutherland 2007-2008*. Scottish Natural Heritage Commissioned Report No. 312. SNH, Golspie.
- Natural England, 2009. *Natural England Technical Information Note TIN051 (First Edition): Bats and onshore wind turbines Interim guidance*. Natural England, Peterborough.
- Natural England. 2014. *Natural England Technical Information Note TIN051 (Third Edition): Bats and onshore wind turbines Interim guidance*. Natural England, Peterborough.
- Rodwell, J S (ed.). 1991a. *British Plant Communities, Vol. 1: woodlands and scrub*. Cambridge University Press, Cambridge.
- Rodwell, J S (ed.). 1991b. *British Plant Communities, Vol. 2: mires and heaths*. Cambridge University Press, Cambridge.
- Rodwell, J S (ed.). 1992. *British Plant Communities, Vol. 3: grasslands and montane communities*. Cambridge University Press, Cambridge.
- Rodwell, J S (ed.). 2000. *British Plant Communities, Vol. 5: maritime communities and vegetation of open habitats*. Cambridge University Press, Cambridge.
- Rodwell, J.S. 2006. *National Vegetation Classification: Users' Handbook*. JNCC, Peterborough.
- Roper, T.J. 2010. *Badger*. HarperCollins Publishers, London.
- Scott, R. (ed) 2011. *Atlas of Highland Land Mammals*. Highland Biological Recording Group.
- Scottish Natural Heritage (SNH). 2001. *Scotland's Wildlife: Badgers and Development*. SNH, Battleby.
- Scottish Environmental Protection Agency (SEPA). 2012. *Land Use Planning System SEPA Guidance Note 4: Planning Guidance on Windfarm Developments*. SEPA.
- SNIFFER. 2009. *WFD95: A Functional Wetland Typology for Scotland - Project Report*. ISBN: 978-1-906934-21-7.
- Stace, C. (2010) *New Flora of the British Isles*, 3rd edition. Cambridge University Press, Cambridge.

UK Technical Advisory Group on the Water Framework Directive (UKTAG). 2003. *Guidance on the identification of groundwater dependent terrestrial ecosystems*. UKTAG.

UKTAG. 2009. *Guidance on the identification of groundwater dependent terrestrial ecosystems: Annex 1 – NVC plant communities and dependency on groundwater*. UKTAG.